Amendments to the Claims

1. (Original) A catalyst system effective for catalyzing the (co)-polymerization of α-olefin, the catalyst system comprising a catalyst component prepared by:

(a) reacting a compound having the formula R_3M with an amine having a nitrogen-hydrogen bond;

(b) reacting the product of (a) with a dialkylmagnesium compound;

(c) reacting a compound containing a cyclic diene group with an early transition metal compound; and

(d) reacting the product of (b) with the product of (c);

wherein R is hydrocarbon and M is selected from the group consisting of aluminum, boron, gallium, and indium.

2. (Amended) The catalyst system of claim 1, wherein [[R_3]] R is a C_{1-13} hydrocarbon.

3. (Original) The catalyst system of claim 1, wherein R_3M is selected from the group consisting of triethylborane, tributylborane, trimethylaluminum, triethylaluminum, tri-isobutylaluminum, trihexylaluminum, trioctylaluminum, and trimethylgallium, triethylgallium, trimethylindium, and triethylindium.

4. (Original) The catalyst system of claim 1, wherein the amine having a nitrogen-hydrogen bond is selected from the group consisting of butylamine, t-butylamine, hexylamine, heptylamine, dibutylamine, di-sec-butylamine, di-tert-butylamine, dihexylamine, dicyclo-hexylamine, piperidine, aniline, 2,6-diethylaniline, and 2,6-di-tert-butylaniline.

5. (Original) The catalyst system of claim 1, wherein the amine having a nitrogen-hydrogen bond is a cyclic amine.

6. (Original) The catalyst system of claim 1, wherein the amine having a nitrogen-hydrogen bond is selected from the group consisting of piperidine, pyrrolidine, and pyrrole.

7. (Original) The catalyst system of claim 1, wherein the amine having a nitrogen-hydrogen bond is selected from the group consisting of dicyclopentylamine, dicyclohexylamine, dicycloheptylamine, and dicyclooctylamine.

8. (Original) The catalyst system of claim 1, wherein the dialkylmagnesium compound is selected from the group consisting of butyloctylmagnesium, dibutylmagnesium, and butylethylmagnesium.

9. (Original) The catalyst system of claim 1, wherein the compound containing a cyclic diene group is selected from cyclopentadiene, indene, (t-butyl)-cyclopentadiene, methylethylcyclopentadiene, 1,3-cyclohexadiene, and 1,5-cyclooctadiene.

10. (Currently Amended) The catalyst system of claim 1, wherein the early transition metal compound has the formula ~~$M'O_pR_qX_r$~~, $M'O_pR^1_qX_r$ wherein O is oxygen, [[R]] R^1 is alkyl, X is halogen, and p, q, and r are numbers from 0 to 4, and M' is Ti, Zr, or V.

11. (Original) The catalyst system of claim 1, wherein the early transition metal compound is selected from the group consisting of $Ti(OCH_3)Cl_3$, $Ti(OC_2H_5)Cl_3$, $Ti(OC_4H_9)Cl_3$, $Ti(OC_8H_{17})Cl_3$, $Ti(OCH_3)_2Cl_2$, $Ti(OC_2H_5)_2Cl_2$, $Ti(OC_4H_9)_2Cl_2$, $Ti(OC_8H_{17})Cl_3$, $Ti(OCH_3)_4$, $Ti(OC_2H_5)_4$, $Ti(OC_4H_9)_4$, $Zr(OC_4H_9)_2Cl_2$, $Zr(OC_8H_{17})Cl_3$, VCl_3, VCl_4, and $VOCl_3$.

12. (Original) The catalyst system of claim 1, further comprising a solid magnesium halide support.

13. (Original) The catalyst system of claim 1, further comprising an alkylaluminum co-catalyst.

14. (Original) The catalyst system of claim 1, further comprising an alkylaluminum co-catalyst selected from the group consisting of triethylaluminum, tributylaluminum, trioctylaluminum, and trimethylaluminum.

15. (Original) The catalyst system of claim 1, further comprising a hydrocarbon solvent.

16. (Original) A method of (co)-polymerizing α-olefin, the method comprising contacting an α-olefin feed stock with a catalyst system effective for catalyzing the (co)-polymerization of α-olefin, wherein the catalyst system comprises a catalyst component prepared by:

(a) reacting a compound having the formula R_3M with an amine having a nitrogen-hydrogen bond;

(b) reacting the product of (a) with a dialkylmagnesium compound;

(c) reacting a compound containing a cyclic diene group with an early transition metal compound; and

(d) reacting the product of (b) with the product of (c);

wherein R is hydrocarbon and M is selected from the group consisting of aluminum, boron, gallium, and indium.

17. (Amended) The method of claim 16, wherein [[R3]] R is a C_{1-13} hydrocarbon.

18. (Original) The method of claim 16, wherein R_3M is selected from the group consisting of triethylborane, tributylborane, trimethylaluminum, triethylaluminum, tri-isobutylaluminum, trihexylaluminum, trioctylaluminum, and trimethylgallium, triethylgallium, trimethylindium, and triethylindium.

19. (Original) The method of claim 16, wherein the amine having a nitrogen-hydrogen bond is selected from the group consisting of butylamine, t-butylamine, hexylamine, heptylamine, dibutylamine, di-sec-butylamine, di-tert-butylamine, dihexylamine, dicyclo-hexylamine, piperidine, aniline, 2,6-diethylaniline, and 2,6-di-tert-butylaniline.

20. (Original) The method of claim 16, wherein the amine having a nitrogen-hydrogen bond is a cyclic amine.

21. (Original) The method of claim 16, wherein the amine having a nitrogen-hydrogen bond is selected from the group consisting of piperidine, pyrrolidine, and pyrrole.

22. (Original) The method of claim 16, wherein the amine having a nitrogen-hydrogen bond is selected from the group consisting of dicyclopentylamine, dicyclohexylamine, dicycloheptylamine, and dicyclooctylamine.

23. (Original) The method of claim 16, wherein the dialkylmagnesium compound is selected from the group consisting of butyloctylmagnesium, dibutylmagnesium, and butylethylmagnesium.

24. (Original) The method of claim 16, wherein the compound containing a cyclic diene group is selected from cyclopentadiene, indene, (t-butyl)-cyclopentadiene, methylethylcyclopentadiene, 1,3-cyclohexadiene, and 1,5-cyclooctadiene.

25. (Currently Amended) The method of claim 16, wherein the early transition metal compound has the formula ~~$M'O_pR_qX_r$~~, $M'O_pR^1_qX_r$ wherein O is oxygen, [[R]] R^1 is alkyl, X is halogen, and p, q, and r are numbers from 0 to 4, and M' is Ti, Zr, or V.

26. (Original) The method of claim 16, wherein the early transition metal compound is selected from the group consisting of $Ti(OCH_3)Cl_3$, $Ti(OC_2H_5)Cl_3$, $Ti(OC_4H_9)Cl_3$, $Ti(OC_8H_{17})Cl_3$, $Ti(OCH_3)_2Cl_2$, $Ti(OC_2H_5)_2Cl_2$, $Ti(OC_4H_9)_2Cl_2$, $Ti(OC_8H_{17})Cl_3$, $Ti(OCH_3)_4$, $Ti(OC_2H_5)_4$, $Ti(OC_4H_9)_4$, $Zr(OC_4H_9)_2Cl_2$, $Zr(OC_8H_{17})Cl_3$, VCl_3, VCl_4, and $VOCl_3$.

27. (Original) The method of claim 16, wherein the catalyst system further comprises a solid magnesium halide support.

28. (Original) The method of claim 16, wherein the catalyst system further comprises an alkylaluminum co-catalyst.

29. (Original) The method of claim 16, wherein the catalyst system further comprises an alkylaluminum co-catalyst selected from the group consisting of triethylaluminum, tributylaluminum, trioctylaluminum, and trimethylaluminum.